REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188), Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE	3. REPORT TYPE AND DATES COVERED
	18.Jan.01	THESIS

4. TITLE AND SUBTITLE
UNITED STATES AIR FORCE CASUALTY COLLECTION POINTS: CRITICAL MANNING BETTER SPENT ELSEWHERE

5. FUNDING NUMBERS

6. AUTHOR(S)
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7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
UNIVERSITY OF TEXAS HSC SAN ANTONIO

8. PERFORMING ORGANIZATION REPORT NUMBER
CI01-17

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
THE DEPARTMENT OF THE AIR FORCE
AFIT/CIA, BLDG 125
2950 P STREET
WPAFB OH 45433

10. SPONSORING/MONITORING AGENCY REPORT NUMBER

11. SUPPLEMENTARY NOTES

12a. DISTRIBUTION AVAILABILITY STATEMENT
Unlimited distribution
In Accordance With AFI 35-205/AFIT Sup 1

12b. DISTRIBUTION CODE

13. ABSTRACT *(Maximum 200 words)*

14. SUBJECT TERMS			15. NUMBER OF PAGES: 17
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT	18. SECURITY CLASSIFICATION OF THIS PAGE	19. SECURITY CLASSIFICATION OF ABSTRACT	20. LIMITATION OF ABSTRACT

UNITED STATES AIR FORCE CASUALTY COLLECTION POINTS: CRITICAL MANNING BETTER SPENT ELSEWHERE

By
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The Air Force Medical Service's dispersed casualty collection point policy offers limited gains to air base support and survivability of the wounded. Historical review of air base attacks indicates that modern aircraft range and refueling capability have allowed air bases to remain far to the rear and thereby significantly reduced the risk of future base attacks. If one was to occur, self-aid and buddy care will provide the first aid to the wounded, and they would be transported directly to the hospital. Because the distance from any work center on base and the hospital is so short, an intermediate stop at a casualty collection point would increase the interval between injury and definitive surgery, and therefore decrease survivability. It will be essential to the success of future conflicts that critically limited medical manning is concentrated at the hospital and not divided between various taskings to include 1-3 casualty collection points as the policy has been designed. This will optimize the care for the base wounded and maximize efficiencies for the constant flow of wounded out of the theater of battle, into the hospital, and up the echelons of care. This review of the literature has provided the expertise and arguments to suggest a change in Air Force policy concerning the use and manning of casualty control points that will result in more efficient use of limited manpower and improved morbidity and mortality during times of armed conflict.

The views expressed here do not necessarily reflect the views or policies of the Department of Defense or the U.S. Air Force, but are solely those of the author.

Introduction

This is a scholarly review of the literature to ascertain what effect air base "casualty collection points" (CCPs) have on casualty survival, warfighting capability, and base medical support. The CCP is a specific location where combat casualties are assembled prior to transport to a Medical Treatment Facility (MTF). The CCP's merits and deficiencies as it was used in recent military conflicts (involving the United States or other nations) and in the civilian sector will be discussed.

The Joint Health Services Support Vision 2010 (Adams 1997) identified the first responder, forward resuscitative surgery, theater hospitalization, and en route care as the four-phase continuum of Casualty Care and Management that will support the Department of Defense warfighting efforts into the 21st Century. As primary foci for Casualty Care and Management support for future operations, this paper proposes the Air Force Medical Service adopt a different method from the CCP concept to provide primary response to the wounded at the site of injury while taking advantage of the proximity of forward resuscitative surgery at the MTF to offer the wounded their best chance for survival.

During the "cold war", the US strategic and tactical defense concept of operations against the Warsaw Pact nations was to force sufficient delays in the enemy's advance across Europe so as to allow US reinforcements to arrive in sufficient quantities to stage a counter-offensive. Army CCPs provide sound casualty support for mobile combat. As forces attack or retreat, coordinated CCP locations facilitate efficient movement of casualties up the echelons of care. In the major war scenario, the theater air base was a high priority fixed target with both conventional and a significant chemical weapon threat. Most base support plans directed that mobile second echelon MTFs be moved about 10 miles off base to allow patient care to be performed in a non-contaminated environment. CCPs were set up around the base to allow the warfighters who escorted their wounded colleagues to return to their work centers sooner while consolidating the wounded for more efficient transport to the displaced MTF.

With the fall of the Soviet Union, the US found itself facing many smaller armed conflicts and operations rather than a major war with the exception of a Korean scenario that could present a viable major conflict scenario in which AF bases would be in a hostile environment. This paradigm shift required different concepts of operation that has proved elusive. The problem is that CCPs continue to be exercised and inspected as part of operational readiness inspections but they were not utilized on air bases during Operation Desert Storm or Operation Allied Force. Why would the AF train bases to expect to provide and receive medical care in one way and then when it really counts change that plan? An alternative would be to provide "self-aid and buddy care" (SA/BC), have each unit/work center transport casualties directly to the MTF, and dispatch the primary response team to any mass casualty disaster.

First response, SA/BC, in the work centers will be the key to survival for many wounded. The AF SA/BC program provides a good baseline of first responder care in peacetime but due to the increased evacuation times that can be dictated by the tactical environment, more advanced care is warranted. A program similar to the Army's combat lifesaver, would offer improved resuscitation that could carry the wounded through the 'golden hour' while the base is shut down during any hostile action against the base.

The distance from the work center to the MTF is short enough that it makes more sense to complete the transport of the wounded to it than to stop at a CCP that reinforces first aid but does not provide resuscitative nor definitive care. The Israeli Self Defense Force moved their surgical resuscitation capabilities forward to the front line and found that this improved survivability compared to immediate evacuation (Naggan 1974 & 1976.) Mortality from war wounds was reduced by 10-25% because patients

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Approved for Public Release
Distribution Unlimited

20010314 055

could be evaluated and stabilized by medical officers at the front within 60 minutes. Because an air base covers such a small area, its forward resuscitative surgery capabilities will always be essentially on the front line. The gains in survivability are drastically reduced if patients are required to be brought to the CCP instead of the MTF.

Base medical support plans must address the best way to provide mass casualty contingency response. Predesignated CCPs that are geographically dispersed around a base might have limited relationship between a disaster and the MTF and thus offer minimal assistance to the injured. Coordinated and highly trained primary response teams deployed to the disaster site provide the best chance to minimize the morbidity and mortality of the injured. Consolidating medical personnel at the hospital and responding as needed offers better response while optimizing daily patient care and any surges provided by the Aeromedical Evacuation (AE) system.

As a result of this research and my limited practical experience in the Aerospace Medicine field, I am suggesting that a more robust SA/BC program that includes work center combat lifesavers and direct transport of the wounded to the MTF should replace the CCP. This will increase survivability of the wounded, unit morale, and improve base medical support via more efficient provision of mass casualty care and AE support without negatively impacting the warfighting mission. The CCP and this alternative policy need to be objectively tested for efficiencies by the Health Services Inspection Agency of the AF between those bases that do and those that do not have CCPs. This objective assessment of war fighting capability versus medical care should validate any changes that might need to be made to improve base medical services.

Methods

This historical literature review was conducted to determine if a modification of Air Force CCP policy should be made. Resources were identified through searches for the keywords (combat, casualty, patient, collection point, care, war, buddy care, self aid, triage, medical, disaster, wounded) in the title, abstract, and descriptor / key word fields in 1966-99 MEDLINE, PUBMED, and GRATEFUL MED searches and GOOGLE, YAHOO, and NORTHERN LIGHT search engines. The review was limited to English language papers, references from their bibliographies, and foreign language paper abstracts.

Resources were included if they addressed the following topics or referenced the CCP (and excluded if they did not): air base threat, casualty mix, echelons of care, prehospital care, SA/BC, CCP theory, AE requirements, manning, and civilian mass casualty management. Experts (Tactical Evaluation and Major Command inspectors of the CCP and Operation Allied Force after-action medical conference participants) were interviewed as to their opinions and current practice.

The effect that a permissive versus a hostile environment has upon operations, casualty generation, and combat support was evaluated. Army Field Manual 101-5: Operational Terms and Graphics defines permissive environment as one where the host country military and law enforcement agencies have control, intent, and capability to assist operations. Permissive base threats are usually terrorists, missiles, or bombs. Hostile environments (hostile forces have control, intent, and capability to effectively oppose or react) threats are the same but include the more direct dangers of combat infantry and armor troops with fixed and rotary wing support. The comments, data, and discussion on the development of the CCP for the Army were compared for similarities and differences with Air Force and civilian use of CCPs.

Medical reviews for various (U.S. and foreign) combat operations were assessed for significant contributions or deficiencies in the SA/BC programs to highlight the types of casualties that these programs most impact upon and to draw parallels with the care that would be provided at CCPs or by the army's 'combat lifesavers.' Current literature that addressed the value of civilian and combat prehospital care were reviewed to evaluate the strengths and weaknesses of the CCP concept. The management of civilian mass casualty incidents and casualty types were assessed for the needs and benefits of onsite triage, care, and casualty evacuation compared with 'scoop and run' care where the patient is picked up and transported immediately. Articles that addressed sending personnel out to the field versus maintaining resources at the MTF were evaluated and summarized for benefits to either plan. Past operations were assessed for the impact that wounded in action and disease and non-battle injury requirements had upon the echelons of care, AE mission, and individual base medical manning.

Air Base Threat

US dominance in the conventional military arena adversaries will have to seek out asymmetric means for attacking US forces or base's aircraft or capability to launch and receive aircraft via terrorist or missile attack. Terrorist bombings will be uncommon events, if they happen at all in the permissive environments of allied held land, due to the heightened sensitivity to force protection resulting from the Khobar Tower incident in Beirut, Lebanon. If a small terrorist contingent does cross into the base compound and engage the security forces within the housing or work areas, one can expect the number of casualties to increase as documented in urban vs. jungle warfare in Vietnam (Blood 1994.)

Vick's (1995) study of air base attacks from 1940 to 1992 highlighted that standoff attacks using unsophisticated direct or indirect weapons have successfully destroyed or damaged over 2,000 aircraft during 645 attacks. Rare missile attacks such the Iraqi scud missile strike reported by Humphrey (1999) on a barracks in Dhahran, Saudi Arabia during Operation Desert Shield is an example of an isolated mass casualty situation where the documented 10% immediate deaths and 40% wounded required on site care and immediate evacuation to local hospitals.

Even though the Operational Health Support into the Next Millennium (Brannon 1998) predicts a reduction in total combat casualties as major theater wars are averted, there were still 30 major armed conflicts (prolonged combat incurring 1000 battle-related deaths) waged in 25 locations around the world in 1995 (Leppaniemi 1998). In addition, there were an increased number of much smaller-scale humanitarian assistance, peacekeeping (16 around the world in 1998; Seet 1999) and peace-making operations that might put AF troops at risk of armed conflict when they deploy to the range of bare to fully robust bases. Baker (1999) noted that even natural and man-made disaster operations during peacekeeping missions necessitate an aggressive security posture due to land mines, armed factions, and terrorist activities that will require rapid evacuation to the MTF as well.

History of air base attacks, aircraft cost and vulnerability while on the ground, end of the cold war, and increased range resulting from superb refueling capabilities, have all influenced AF operations to move operations back from potentially hostile to permissive environments where there is a decreased threat of direct combat. Rare attack on a base and the resulting mass casualty scenarios allows critical manning to be focused elsewhere than a CCP.

Casualty Mix

Reviewing reports of casualty types and proportions provides planners objective data with which they can distribute the number and specialties of medical personnel to provide optimal base support. With the casualty types in mind, one has to assess to what extent a CCP will improve or diminish survivability. Conclusions drawn from comparisons between combat wounded and civilian trauma casualties need thoughtful consideration of the consistent differences: military has a higher proportion of penetrating injuries (90% vs. 66%, Smith 1988,) less well established Emergency Medical Services, prolonged evacuation time, younger victim distribution, and less consistent and objective military data.

Most civilian disasters are of moderate size (100-200 casualties) of whom less than 15% are seriously injured (Waeckerle 1991.) Analysis of civilian disaster victims by de Boer (1984) also found that 10% have respiratory and circulatory problems that demand immediate attention (30% will die within the first hour.) 30% will require hospitalization and treatment, which if not received, will need to be reclassified into priority patients. These 10-30% of casualties are the population that will benefit from the change to policy whereas the majority of patients (60%) will not need advanced nor immediate care. Minor patients will require transport to the MTF for evaluation and minor treatment of simple fractures or lacerations and the detainment at the CCP will not impact their survival but will increase the error in triage at the CCP due to the increased patient load and overwhelming personnel not specially suited to triage.

Potentially the most significant mortal wound that can be mitigated in the field produces exsanguinating hemorrhage. The vast majority (67% in Korea, Carey 1988 and 66% in Vietnam, Jones 1968) of combat wounds was to the extremities and has risen in recent conflicts due to the increased use of body armor and Kevlar helmets. Many of the casualties that 'Died of Wounds' had exsanguinating extremity injuries that became life threatening because of poor first aid, failure to reinforce bandaging, or failure to use (or use correctly) tourniquets (Carey 1996.) 98 of 500 consecutive casualties that were 'Killed in Action' exsanguinated from arterial sites that first aid measures (direct pressure or application of a tourniquet) would have easily stopped the bleeding. Even then, of 224 patients with arterial wounds who reached the MTF, 87% were still actively bleeding from sites easily accessible to control by first aid measures (Bellamy 1984.) Casualty data from the Lebanon War in 1982 revealed that 94% of the 351 soldiers who died of wounds, died within 1 hr of wounding (30% exsanguination) and 6 out of 7 died from exsanguinations 1 to 4 hours from time of wound (Gofrit 1997.)

Terrorist bombing results in more blunt trauma with higher rates of head injuries and fatalities (Coooper 1983, Frykberg 1988 & 1989.) Injuries are primary (internal from the shock wave), secondary (shrapnel / debris), tertiary (deceleration impact into a stationary object), and flash burns (Feliciano 1998.) Frykberg (1988) performed an extensive review of terrorist incidents and found that blast force, time from injury to treatment, and anatomic region of injury all correlated with survivability. Of the 3357 people who were bombed in 220 world wide terrorist incidents, 87% were immediate survivors and 30% required hospitalization. Soft tissue injury occurred in 37%, major bone fractures in 27%, and head injury in 19% and therefore does not represent the same exsanguination risk that highlights SA/BC intervention on survivability (Frykberg 1987) but reinforces the lack of significant intervention that can occur at the CCP.

Echelons of Care

The concept of echelons of care has developed and been validated over the history of combat medical care by optimizing survivability. On an air base one needs to keep in mind that the limited area of medical coverage compresses the echelons together so that the front lines can be translated into the work centers and flight line where first echelon SA/BC is performed. The Battalion Aid Station, MTF, and forward resuscitative surgery are normally collocated and provide the second echelon support. Higher echelons of care have limited significance in a discussion of the utility of fielding CCPs except that where the reception of casualties from lower echelons limits the MTF's ability to man the CCPs.

The delay in evacuation and distances over which modern ground combat takes place needs to be evaluated in order to appreciate the significant contributions that the echelons of care. The echelon system has evolved to its current form so that each higher echelon of care adds a new treatment capability that distinguishes it from the previous echelon. First echelon care is provided at

or near the site of injury and is referred to as SA/BC because care is limited to first aid measures provided by the wounded victim or his or her buddy. Army casualties may be transported by non-medical conveyance from the site of injury directly to a centralized CCP or a Battalion Aid Station that is maintained within 1.5-2 km of the Forward Edge of the Battle Area due to the rapidly mobile and fluid nature of combat. At the Battalion Aid Station, the first physician to evaluate and treat the wounded triages them to get them back to combat or stabilizes them for further evacuation (Swan 1996.) The lack of patient holding capability, necessity to move with its battalion of 3-500 personnel, and required readiness to receive successive additional waves of patients make triage less selective than in echelons farther to the rear (Llewellyn 1992.)

About 10 Battalion Aid Stations will evacuate their patients 5-10 km to the second echelon medical clearing company. Its objective is to perform the primary triage, rapidly return to duty the maximum number of casualties possible to the warfighting units, and prepare casualties via its forward resuscitative surgery capabilities for evacuation to the next higher echelon of care (Hawley 1996.) The third echelon is the first level of care staffed and equipped to provide definitive surgical care and inpatient medical care.

The "golden hour" for trauma care is spent in the pre-hospital environment and initial surgery had traditionally not been available for up to 12 hours post injury (Llewellyn, 1992) and therefore required a hybrid of different echelons. The Israeli Self Defense Force improved survivability and demonstrated more efficient use of the available hospitals for definitive care when it moved surgical assets forward to stabilize the patients prior to evacuation (Naggan 1974.) If the patient cannot reach the hospital within 15-30 minutes, on-site treatment and stabilization was performed. It is not the evacuation but the primary treatment (airway management, hemostasis, and prevention of shock) and preparation for transport (dressing and splinting, analgesics) that are urgent (Naggan 1976.)

As the tactical situation, poor evacuation assets, and hilly terrain prevented the evacuation of patients to the Croatian Medical Service surgical capabilities in the rear, higher mortality (6.5%) and disability were seen (Prgomet 1996.) Following the lead of the Israelis in an attempt to decrease the time between wounding and surgical treatment (Lovric 1997) the Croats pushed surgical resuscitation forward to the front lines with good results (Radonic 1993, Petricevic 1998). Mortality at the field hospital was 0.75% when providing immediate resuscitation with delayed transport and 1.9% with immediate evacuation (Jevtic 1996.) Both compared favorably with the total mortality for American wounded in Vietnam (1.6-3.5%) and the Israelis in the Israeli-Arab War (0.5-2.3%.)

During 'Operation Just Cause', the US utilized 3 forward Army-doctrine CCPs to provide first echelon medical care and collect patients for helicopter evacuation back to the second echelon center (mobile aeromedical staging facility with forward resuscitative surgery augmentation) on the flight-line at Howard AFB (Vermillion 1996.) In response to demonstrated needs and successes the Air Force Medical Service has developed the expeditionary AF to provide forward resuscitative surgery with the initial package of medical support for bare base operations. Established air bases have their surgical capabilities collocated within a couple miles of the work centers thus offering the same improved survivability if the wounded are transported directly back to the surgical capability of the MTF.

Prehospital Care

19th century Baron Dominique Jean Larrey, chief surgeon in the army of Napoleon, made two improvements in the care of wounded soldiers that have persisted to modern times. The ambulance volante ("flying hospital") were horse drawn ambulances that reduced the time it took to get the wounded to definitive care, then concentrated them in an area as near the front lines as possible to make it easier to operate on them (Trunkey 1983.) Trunkey's modern studies identified a 'tri-modal trauma death versus time interval' curve that highlighted the relationship between injury and definitive treatment that is critical to the probability of recovery since greater than 50% of trauma deaths occurred within an hour of the accident. Despite the most sophisticated first aid procedures, 30% die between 1-3 hours mainly due to neurological injury and various types of hemorrhages for which the larger proportion of these patients could be saved by adequate, efficient and urgent medical measures.

Rapid evacuation of casualties to definitive care was optimized in Vietnam where casualties were taken directly from the battlefield to the corps surgical hospitals. The average time lag between injury to definitive surgery was reduced to 65 minutes with a corresponding reduction in mortality to 1.7 percent (Trunkey 1983.) Cowley (1982) stressed that the time lost from the golden hour to get the patient to definitive surgery (ie. due to geography or tactical environment) should be stringently limited. It should not be utilized inappropriately by anyone except for those providing the definitive surgery because 60% of those who will die from trauma do so within 4 hours (Committee on Trauma 1986.) The CCP concept runs counter to this advice as its personnel triage patients, check and reinforce bandages, apply simple airway maneuvers, but do not provide significant intervention.

Trauma involving major vascular injury may be best treated by 'scoop and run' since advanced life support only delays the time to definitive surgical treatment (Deakin 1994, Schou 1996.) Despite the fact that the majority of the wounded (within 1000 meters of the MTF at the time of injury) did not receive first aid before reaching the hospital, there was minimal impact for even those patients with excessive bleeding or multiple injuries during the siege of Tripoli (Fosse 1988.) Clinical studies of trauma patients indicate that fluid resuscitation before definitive hemostasis has been achieved may accelerate blood loss and lead to increases in mortality (Bickell 1994, Deakin 1994, Hawley 1996, McCallum 1996, Batty 1999) and also supports 'scoop and run.'

In contrast to the cardiac arrest victim, trauma patients do not receive the same benefit from EMT intervention because it is resuscitative and not definitive (Smith 1985.) Many studies indicated that if the time to definitive care is shorter (written as < 20-30 minutes) than conducting the intervention, it is best to transport the victims directly because they will only receive a fraction of the fluid they might need (Border 1983, Smith 1985, Lloyd 1987, Slovis 1990, Rouse 1991, Deakin 1994, Lynch 1997.) On most air

bases, the distance to the MTF is so short that this is almost always the case.

Optimal prehospital care ('scoop and run' vs. 'stabilize in place') is dependent upon the type of injuries sustained (Deakin 1994) and the environment in which the Emergency Medical Services system is working. Advanced urban systems have very highly trained and experienced paramedic support with level-one trauma centers but are an unrealistic expectation in the overseas military setting. Koehler (1994) noted that not one of over 100 medics at a surgical support company transitioning from Desert Shield to Storm had ever seen actual Advanced Trauma Life Support care being given to a major trauma victim and few had ever started an IV since their initial training. This was also documented for the civilian sector when Donovan (1989) described the skill deterioration of rural providers and can be used to question the effectiveness of the CCP in decreasing morbidity and mortality.

Compared to the prehospital care trauma literature that quotes up to 30 minutes transport time as requiring the 'scoop and run' technique to get patients to definitive care, some patients with uncontrolled hemorrhage do better without IV rehydration for up to 4 hours (Butler 1996.) Regardless of the above-mentioned negative effects, vigorous fluid resuscitation should be instituted for wartime patients with externally controllable bleeding who are subject to delayed evacuation (Wiedeman 1999,) and those with uncontrolled hemorrhage with mental status changes (Butler 2000.)

Only if the patient requires extended extrication or there will be other delays until definitive treatment should extensive field resuscitation be performed (Martin 1993.) Current teaching in Advanced Trauma Life Support promotes the insertion of two large bore IV's with crystalloid hydration. However, experience shows only those casualties in shock require this intervention because it can have a negative impact upon combat effectiveness and medic time and IV supplies should be conserved for the more significantly wounded (Butler 2000.) During the 2-4 hour average evacuation in Operation Desert Storm, the replacement of 1500cc of blood loss would require 8 liters of crystalloid because only 20% of that infused will remain in the intravascular space. This was reported in reviews of prehospital care in Vietnam that indicated that overzealous resuscitation with crystalloid had deleterious effects on the intra / postoperative patient in the form of shock lung (Cowley 1982, Pearce 1999.)

Self-Aid and Buddy Care

Combat wounded can be distributed into immediate deaths, minimally injured, and those that resuscitative interventions will save their lives if performed within 1-3 hours. SA/BC is the bridge that enables those that can be saved to get to definitive care at a MTF (Dolev 1985, Cain 1986, Cancio 1993.) Immediate first aid on the battlefield proved to be a tenant of combat casualty care during the '67 and '73 Arab-Israeli Wars (Dolev 1985.) Israeli Self Defense Force soldiers pulled their tanks and armored fighting vehicles out of the line to evacuate their wounded comrades to a Battalion Aid Station despite the fact that their units were engaged in combat. Medical officers indicated that this should be corrected with increased first aid training. In preparation for the 1982 war selected units received 60 hours of field SA/BC training that emphasized resuscitation and stabilization. Unauthorized use of fighting vehicles for the evacuation of wounded was eliminated and significantly reduced morbidity and mortality from combat trauma was noted when compared to those that did not get the training (Kaufman 1984.)

The initial medical intervention provided during the first few minutes is considered to be the most significant contribution to the decrease morbidity and mortality on the battlefield (Brannon 1998.) Many studies of US combat care delivered similar findings. Maughon (1970,) Vietnam Wound Data and Munitions Effectiveness Team data from 1970 for casualties who left the battlefield alive, and Bellamy (1987) identified that those wounded who were killed in action died as a result of exsanguination from sites that could have been controlled by simple first aid. As a result, Department of Defense Directive 6020.1, 29 Jul 80, requires SA/BC training for all of the uniformed services.

Bellemy (1987) highlighted its importance when he noted that 15-20% of those killed in action might be saved by first aid but is reduced to 5-10% due to the tactical situation, evacuation distance, and actual accessibility to the life-threatening lesion. Dupuy addressed the tactical issues of attrition when he pointed out that the increased lethality of modern weapons has forced a greater dispersion of combat troops. Platoons are now expected to cover up to 1-km cross section of the Forward Edge of the Battle Area as compared with the Korean conflict that had a line of 200 meters. Most engagements during the Falklands War took place at night on remote hillsides in adverse weather conditions. As a result of this and hostile fire or fields of view of the enemy, many casualties, including some who had lost limbs, lay virtually untreated for up to 5-7 hours (Bailey 1983.) This was demonstrated most recently as the Croats initial treatment for the majority of wounded during the first few minutes or hours of a battle was done by themselves or their comrades in arms (Vojvodic 1996, Jankovic 1998.)

Unit medical training, SA/BC measures, and immediate first aid increase survivability and act as a combat force multiplier by enhancing troop confidence and morale (Donovan 1989.) The Israeli and US Special Operations troops have demonstrated decreased combat morbidity and mortality through individual knowledge and intervention. Many examples of the benefits of training are documented in real world situations where the combat soldiers, not the medics, have saved lives with their learned medical capabilities. Many disaster and prehospital trauma care studies have also noted that increasing civilian education would enable the uninjured or slightly injured co-victims to provide first aid within minutes of injury and thus make a significant contribution to survivability (Safar 1988, Ricci 1991, Pretto 1992.)

The Army has increased the training for a cadre of its soldiers in each line unit to become "combat lifesavers" (FM 8-55 Planning for Health Service Support.) The training includes initial triage, airway and breathing management, administration of fluid therapy, wound care, analgesia, appropriate antibiotic administration and patient evacuation. In the event of an attack that results in

wounded, these combat lifesavers perform immediate clinical care and stabilization of severely wounded patients beyond that taught in SA/BC. The acquisition and maintenance of these competencies through initial and sustained medical training requires significant investment but its impact upon survivability and the resulting morale within the work centers will be well worth the investment. Cancio (1993) observed that the additional 40 hours of combat lifesaver training given for one out of every ten combat squad members greatly improved morale for all soldiers in the division due to the increased confidence in their newly trained and titled "docs". The impact of spatially separated troops and their reliance upon SA/BC to save them can be compared with the time influence brought about when a base is attacked and troop movement is restricted until the threat has been reduced.

CCP Doctrine

Gen. Richardson, commander of the US Army Training and Doctrine Command in 1984, stated that is essential to the success of future operations that future leaders are trained as they will be expected to fight. The air, land, and sea battlefield of the future requires that all armed services establish dependable and reproducible joint doctrine that will guide combined strategy and tactics. Despite the known benefits to morale that rapid evacuation and access to healthcare have on its troops, the US Military is having difficulty in establishing a solid record of providing realistic training that is dependable in battle (Nguyen, 1990.) According to results from the National Training Center, Bellamy (1987,) and reports from the Seventh Conference on Military Medicine (Gunby 1992) and the Government Accounting Office's report "Operation Desert Storm: Full Army Medical Capability Not Achieved" the Department of Defense is not following these guidelines to provide realistic mission-oriented medical training (Slavin 1994.)

The decreasing defense budget has significantly increased the tension felt in the armed services at all levels of command and has forced units to use a variety of means to train and evaluate a unit's readiness. One means of evaluation is the operational readiness inspection, a process that accentuates the command's wartime role and focuses on wartime taskings in deployment, force-protection operations, deployed location operations and daily sustained operations in critical mission areas. Initial Response tests the ability to deploy military forces to a combat theater. Force Protection tests the ability to defend against and recover from hostile actions and to continue necessary operations under increased threat conditions. Deployed Operations focuses on the ability of deployed units to perform their wartime missions and typically runs around the clock for up to three days.

This is the definitive test to determine if a commander has been effective in leading and training their personnel to perform their wartime mission. A 'mission incapable' rating highly questions that commander's ability to command and for the most part will prevent them from obtaining a second command if not immediately removed from the current command. Preparation is highly stressful and therefore imprints significant emotional clarity and priority to those skills, procedures, or operations that prepare them to successfully complete the inspection goals. Clausewitz's 'Fog and Friction of War' described the significantly confounding factors that occur during combat that prevent clear understanding and response to the fast and horrific action. It is these trained behaviors that are relied upon to guide people through the extremely challenging situations experienced in combat.

The operational Air Force (or 'line') consists of the fighters (flying and security squadrons) and the equipment (vs. human) mission support (both logistical and supply functions.) Winning air wars requires the line to accomplish its battlespace mission (ie. acquisition and maintenance of air superiority or putting bombs on target on time,) and due to the above resource limitations, the inspection process primarily focuses on these capabilities. The MTF commander is evaluated on their ability to maintain the fighting force while providing routine and emergent care for the Active Duty members and their families.

CCP development has been influenced by many factors that facilitate the assessment of base medical support readiness. The Medical Evaluation of Readiness and Individual Training concept plan uses the CCP to demonstrate capabilities within an artificially compressed inspection schedule for combat medical care in the first and second echelon. It takes the exercise medical play to a simulated deployed facility and away from the fixed MTF to limit the effect upon daily patient care. In doing so, a base is tested for a hybrid response that neither addresses real world mass casualty situations nor provides a testing environment where members can assess the limitations of the system that they will use in war.

Ongoing doctrine disparity between the Major Commands within the AF concerning the primary responder and CCP issues brings to light differences in mission and doctrine. The CCP allows the line to get those personnel who had been helping transport the patients to the hospital back to their work centers quicker and provides additional evaluation scenarios for the medics while the base is being inspected. Non-physician medical providers supplemented by base manpower resources set up CCPs at geographically dispersed positions around a base to concentrate the wounded, reinforce prior first aid measures, and triage for efficient transport to the base MTF. However the Air Force Medical Service continues to build regulations and policy and exercises the CCP despite its lack of use during Operation Desert Storm and Operation Allied Force. AF Manual 32-4005, Personnel Protection and Attack Actions (1999) requires that shelters arrange for casualty transportation to CCPs, AF Instruction 10-404, Base Support Planning (1994) requires that the location of CCPs are identified on a base and/or local grid map, and new airmen are being taught to expect the CCP in the new AF Manual 10-100, Airman Manual.

1 to 3 CCPs need to be established in close proximity of highly populated target areas, yet far enough away to minimize the chance of collateral damage. Personnel assigned to manage the CCP need to be skilled in the fundamentals of first aid and patient triage so casualties may be sorted and transported to the deployed MTF as soon as possible. While awaiting transportation of casualties, the CCP personnel should insure effective SA/BC measures have been initiated (checking bandages, splints, pressure dressings, tourniquets, etc., and correcting as required). These criteria have been established and reinforced to maintain the process

instead of objectively evaluating its effect on increasing patient survivability, workforce productivity and morale, and mission capability.

The distances over which the Army fights force its commanders to designate CCPs where casualties can be transported to make efficient use of their combat medics while allowing the combat unit to continue to perform its mission on the battlefield. CCPs are crucial because medics cannot be expected to respond to 10 different grid coordinates to pick up 10 individuals at the point of their injury and therefore should be within 1-3 kilometers of the Forward Edge of the Battle Area and flexible to the needs of the tactical situation. Evacuation times from injury to care during Operation Desert Storm increased from 26 minutes to as much as 5 days (Burkle 1994) as the rapidly advancing front caused significant increases in evacuation time over the 72 hours after onset of the ground war.

This is strongly contrasted with an air base's permissive environment allows for a known and dependable MTF (or alternate) location. The average overseas base is 3.3 +/- 1.5 square miles (6.7 sq miles with Anderson Air Base in Guam (32) and Kadena Air Base in Okinawa, Japan (20) but they were greater than 2 standard deviations outside the mean; Stringer 2000.) The average trip from a work area to the base MTF would too short and the time delay too long to set up, man, and organize the CCPs because the distance to the hospital is less than 10km (de Boer 1984.)

Evacuation to the CCP is required to take place within 25 minutes of the end of the attack and another 20 minutes is allowed to get the wounded from the CCP to the MTF but the tactical situation could significantly increase the time to get to the CCP, awaiting transport, and then from the CCP to the MTF. Recent combat care experiences of the Croatians serve to illustrate this point. The Croatians were usually able to provide the wounded with first aid within one hour of wounding and depending upon the tactical situation, were able to evacuated to the field hospitals (8-10km to the rear) within another hour (Maricevic 1997.) This might be considered an argument for CCPs but the reported mortalities (0.5%) were only for extremity wounds. As morbidity and mortality depends upon the timeliness and quality of first aid and definitive surgery (Saric 1994) this offers little argument against direct transport to definitive care. By the time the wounded has reached medical care, Trunkey's (1983) 'golden hour' has probably passed and interventions now need to be both definitive and resuscitative.

Forward resuscitative surgery is the most mature component of the Force Health Protection strategy and was successfully employed by US medical elements in Panama in 1989 during "Operation Just Cause." Advanced planning identified predesignated sites that the ground combat forces used to efficiently funnel casualties to the forward resuscitative surgery located on the flight-line at Howard AF Base (Dice 1991, Vermillion 1996.) It provided vital surgical intervention as close to the point of wounding as tactically possible, focusing on specific life saving practices and preparation for further evacuation. On an air base the forward resuscitative surgery capabilities are usually in the MTF and within 2-5 km of all worksites, and therefore for base support planning purposes, are already forward deployed.

No patient decontamination will take place, however, ambulatory personnel within the CCP are supposed to identify/detect chemical warfare agents, remove gross contamination, and treat casualties exhibiting signs/symptoms of nerve agent poisoning. This disregards the expertise and control of contamination at the MTF patient decontamination stations and puts each CCP at increased risk of exposure from all of the patients being funneled through them.

Once immediate casualties have been stabilized to the extent possible, CCP personnel need to treat casualties with the aim of returning critical sortie generation personnel to duty as soon as possible. Janousek (1999) stated that military mass casualty triage should be performed by physicians due to their significantly higher scores than dentists, nurses, or medics on a written examination that did not add the additional stress that inclement weather, sub-optimal lighting and limited availability of equipment and transportation will all negatively influence the effectiveness of triage. Triage performed at a forward medical company by emergency physicians and surgeons in Operation Desert Storm identified that only 20% of the wounded were critical and needed surgery at the second echelon level but all wounded ended up getting surgery there instead of the indicated stabilization and further evacuation to a higher echelon of care (Koehler 1994.) If experienced triage officers allowed this to occur when they are purported to reduce the number of incorrectly labeled urgent patients by 50%, how effective would a CCP aidman or dentist be in establishing priority for evacuation back to the worksite or to the base MTF?

The high intensity and volume of patient play that is injected into base capability inspections artificially introduces the widely disseminated casualty mixes similar to a natural disaster that might be seen in a tornado or earthquake. It might have appeared that the CCP concept justified the manning and placement of the teams outside the MTF but civilian disaster mitigation efforts to provide intermediate locations for medical care like CCPs have proven to be ineffective and may actually drain medical personnel away from other localities where they could be used (Quarentelli 1977.) Morris (1986) and Bohonos (1999) noted that that triage teams sent out to during natural disasters found no one main disaster site because patients are dispersed throughout the area and might get transport to the MTF before finding one of the CCPs. Morris and Carlascio (1991) noted that most injured arrived at local hospitals by private cars in no specific order of injury severity.

Aeromedical Evacuation Requirements

Airplane (vs. helicopter) AE and Medical Support of Contingency Operations are two of the four Expeditionary AF Medical Service core competencies (Brannon, 1998.) As such it is important to understand the significance of attrition rates and how those rates will impact the AE system, how the shift to reduced in theater medical presence requires increased AE capabilities, and the stresses that are inherent to that system that might threaten a base's medical capabilities.

AE liaison teams work with the AE coordination center to evacuate casualties from the combat zone to the third echelon mobile army surgical and combat support hospitals. Operation Desert Storm was predicted to generate 5000 casualties in the first 24 hours for patient evacuation to third echelon facilities (Crawford 1995) whom the Theater Patient Movement Requirements Center regulates within theater. By monitoring theater casualty reception and hospital bed availability patients are assigned to specific MTFs. Even then, if base hospitals are reasonably nearby and patients can be moved expeditiously to match airlift arrivals, the MTF can expect to receive and / or process patients for AE without an aeromedical staging facility (Strawder 1995.) From there, the mobile aeromedical staging facility coordinates the continued transport back for 200 patients each day, (with an emergency surge capability of up to 300 patients each day) out of the combat theater.

Disease and non-battle injury patients' hospitalization and AE needs to be planned for in future operations. 25% of the 68,000 Vietnam War were disease and non-battle injury admissions that required AE to higher echelon hospitals (Blood, 1993, Walker, 1999) consuming significant theater medical resources and AE assets. Admissions significantly increased with increases in the intensity of combat and far outnumbered admissions for combat wounds but they do not require the resuscitative capabilities of forward medical units, take up bed space, and therefore can limit efficient treatment of the combat casualties. Besides obviously higher wounded in action rates for combat vs. support personnel (Blood 1994, 1995) there are also significantly higher combat disease and non-battle injury rates (0.99-4.03/1000 vs. 0.71-1.15/1000 for support troops) that need to be addressed when designing the base support plan's AE requirements to prevent surges from the combat theater from overloading the base's MTF capabilities. The AF's ongoing involvements in Low intensity conflicts and Military Operations other than War necessitate increased attention to attrition planning. The rotational policy and plans for reinforcement were negatively impacted upon by inaccurate estimations of hospitalization rates that over predicted the hospital and related evacuation requirements for British troops deployed to Bosnia (Croft 1999.)

Depending upon a MTF's echelon or location in the theater or region, the MTF commander must coordinate their resources in planning for the reception of casualties from the Forward Edge of the Battle Area, the base, or the AE system to provide the best care to all of these possible patients. The USAF Surgeon General (1994) directed the Medical Readiness reengineering effort to transport "stabilized versus stable" casualties, and change the emphasis from the traditional 'return to duty' to "Replacement". After evacuation from a second/ third echelon facility to the next echelon of care, casualties not likely to be returned to duty are evacuated in accordance with theater evacuation policy when stabilized (airway secured, hemorrhage controlled, shock controlled and fracture stabilized.)

Projection of the casualty rates is critical to planning for personnel requirements (both medical and combat) to achieve mission accomplishment. The Medical Analysis Tool provides definitive medical force and logistical requirements (how much blood, beds, and surgeons you will need, etc.) by applying requirement and capabilities analyses to the expected duration of operations, the number or personnel involved, and the level of combat. Dupuy (1990) highlights increased dispersion of combat troops, the improvement of medical care and evacuation, and advances in troop personal protection (ie. body armor) as reasons for the decreasing trend in morbidity and mortality during recent wars that medical planners must acknowledge increases the strain on medical facilities and the AE system.

The Medical Analysis Tool also helps to develop the theater evacuation policy that directs the maximum number of days that a patient will be treated in a medical facility in the theater of operations; if they need care in excess of the policy they would be evacuated further to the rear. On 19 Dec 44 during the Ardennes Campaign of World War II the threat of hospitals being overrun by the rapid German advance necessitated that the US First Army evacuation policy would be immediate evacuation (compared to the previous 72 hour policy) to the Theater Support zone. The 72-hr evacuation policy was reinstated when the threat to the field hospitals in the combat zone returned to previous levels. Policy can be based on categories of disease or injury than on number of days of treatment (ie. all burns might be sent to the support zone regardless of projected length of treatment.) Air Force Medical Service facilities at forward locations have 24-hour restrictions for holding wounded prior to evacuation from the forward deployed MTF to the next higher echelon of care (Smith 1988). With a decreasing theater evacuation policy, a larger proportion of patients will be sent out the combat zone requiring fewer medical resources in theater. Despite best plans, these expected patient flows will stretch theater and regional the MTF's capacity beyond capabilities that normal manning could be expected to support.

With this higher survivability, increased accuracy in predicting needs, and decreasing evacuation policies, Operational Health Support into the Next Millennium (1998) discusses the resulting capability and need to reduce the medical footprint at the deployed location and accordingly enhance the evacuation capability.

Manning

Reduction in footprint limits the commander's capability to provide redundancy and forces systems to be maximally efficient. When the basic air force theater hospital commander deploys, they will have 25 personnel (84 personnel with 25 beds) to set up that base's medical services. The variety of personnel has been selectively tailored to mitigate the greatest threats to the mission but will not have been supplemented to set up 1-3 CCPs. Each CCP shift requires a total combination of 8 medical providers supplemented by base manpower resources and a patient retrieval team. Many permanent bases have already tasked 5-10% of the MTF personnel to provide supplementary security and mobilization / operational support. Even if the manning document plans for the

patient retrieval team, just like the patient decontamination team relief, the MTF must initially work these requirements out of its own hide.

If a permanent facility is in the theater when hostilities begin, they will find themselves having to run 24-hour shifts for the expected 80% maximum patient census, providing patient decontamination, and caring for the 100's of patients per day that future conflicts are expected to generate (Crawford 1997.) This point is further reinforced by the Israeli Self Defense Force experience. Due to intermittent air superiority, casualties would arrive in waves that necessitated a high degree of preparedness, personnel, and coordination because some casualties required the simultaneous attention of multiple providers (Rozin 1988.) The 1998 Air Combat Command Theater Hospital concept of operation uses casualty rates of 264 per 4000 base population over 24 hours during normal conditions and 264 casualties in 4 hours during surge conditions to test their readiness. It would be more efficient to develop a consistent and efficient system that utilizes one's entire staff at the hospital instead of having to divide it up amongst the CCPs and bring them back during surges.

Civilian Multiple Casualty

Civilian disaster literature refers to 'CCP' as the site that triage and initial treatment of mass casualties takes place rather than that described in the Medical Evaluation of Readiness and Individual Training concept plan and highlights the positive impact that on site care can make on mass casualty producing disasters. Review of the strengths of civilian response to mass casualty situations provides many essential elements that need to be considered when comparing the merits of CCPs with those of primary response team. One must consider the total capacity of the medical system to mediate the effects of a disaster. Estimation of the required resources for disaster mediation consists of the medical rescue (number of medical professionals, equipment, and supplies,) medical transport (number of ambulances, ease of evacuation and distribution scheme,) and hospital treatment (total number of surgeons, operating rooms, and recovery capability) capacities (de Boer 1989.)

Management of a defined area disaster requires a team to be sent to the site to perform the initial survey, triage of the victims, monitor and utilize local resources efficiently (Fisher 1977, Baker 1979, Gerace 1979, Melton 1981, de Boer 1984, Rignault 1989, Garrison 1990, Jacobs 1991.) The incident manager of a mass casualty scene must first assess the overall safety and security of the site (Christen 1998,) determine if the local contingency response needs to be activated (Ammons 1988,) and the best way to coordinate medical personnel, equipment, and vehicles (Waeckerle 1991.)

After a quick assessment of the medical assets at hand the incident manager must assign other crew members to begin triage and resist the temptation to treat patients. Triage establishes the priority that patients will receive initial resuscitative care and evacuation to the local hospital (Skiendzielewski 1982, Mahoney 1987) but can be a challenge as patients from a disaster present to local hospitals by a variety of means Quarentelli (1983.) This is seen in combat as well when minor casualties arrive at the front-line aid stations shortly after combat has started because they are capable of self-aid, self-ambulation, and may miss the outward positioned CCPs (Ueberle 1985.)

For disasters that produce hundreds of casualties, the push to restore traffic flow and prevent crowd formation drives the speed that patients can be unsystematically cleared from the disaster site to the hospital. Many of the responding support personnel are focused solely on evacuating the patients from the site (Holloway 1978) which if not coordinated with local resources can lead to a second disaster at the hospital as its capability is overwhelmed (Tierney 1985, Haynes 1986, Martin 1990.)

Most of the injured and many associated people will rapidly overwhelm the nearest hospital's capabilities to continue to perform any services other than triage and transport to other hospitals (Naggan 1976.) One way to deal with this influx is to transform the closest hospital into a triage and evacuation hospital to facilitate the transport of the 40-60% immediate or delayed patients that need be stabilized and moved to other hospitals for definitive care (Klausner 1986.) In the opening days of the 1982 Israeli-Lebanon War (Rozin 1986,) the local hospital was reinforced with a military mobile surgical hospital to provide the triage, resuscitation, and evacuation of the wounded. Out of 400 wounded, 3% required life-saving surgery at the hospital, 82% could be evacuated further, and 14% were hospitalized. This was seen in peacetime as well when two planes collided sending one aircraft into the crowd at the Ramstein Air Show on 28 August 1988 (Seletz 1990.) From the estimated 500 injured, 86 of the 120 that were triaged at Landstuhl Army Regional Medical Center were stabilized and transferred to German facilities.

Conclusion

Base support plans provide the best means of mitigating a contingency's negative effects on mission capability. Testing a MTF's readiness to treat combat casualties at a CCP has been an integral part of many Major Command's base support plans however CCPs have never been used in real world situations on air bases. Due to the conflicting message it sends AF warfighters and medics, I researched the basic components that would impact combat casualty care on an air base in the hopes of providing a consistent and viable method of providing base medical support. Direct comparison between the advanced urban trauma Emergency Medical Services and the military systems cannot be performed due to many differences however the methods of intervention and their success or failure used to infer applicability

Standoff attacks on air bases were moderately successful in past wars. That threat contributed to the development of current aircraft range and refueling capabilities that allow the AF to base itself further to the rear in permissive environments. Although the

threat of major war has decreased the AF will continue to be assigned to Low Intensity Conflicts, Military Operations other than War, and Peacekeeping missions that place AF troops at low risk from small unit incursion and terrorist attack.

The echelon system that is used on the battlefield provides increasing expertise as the patient went to the rear can be adapted to the air base. Current weapon lethality and combat doctrine increases the dispersion of troops so they will have to rely on SA/BC for immediate wound care. Improving work center SA/BC capabilities decreases morbidity and mortality and offers personnel chance to impact their own survivability. Just as the Army has ensured early resuscitation by placing the first physician in the Battalion Aid Station, an air base has its providers in its MTF. The Israelis identified and validated the premise that it is stabilization and not evacuation that is urgent and the Croats applied this doctrine and demonstrated that it decreased morbidity and mortality. The difference is that on an air base the first comprehensive triage, patient holding, and forward resuscitative surgery capabilities are collocated with those providers. Forward resuscitative surgery capability has been identified as being critical to current Air Force Medical Service mission success and therefore the advantage of being so close while on a base should not be given up by mandating a stop with questionably long stay at a CCP.

Trunkey's trimodal trauma death vs. time curve identified 30% of the casualties who will die without intervention within 3 hours. Combat most often produces penetrating (vs. blunt) wounds to the extremities that also require definitive care. It was proposed that the lack of proper SA/BC allowed hemorrhage from extremity wounds to account for the greatest morbidity and mortality among these treatable wounds and in fact, threatened Israeli Self Defense Force combat effectiveness. But fluid resuscitation without definitive hemostasis can increase blood loss and mortality because most crystalloid administration is too small of a volume and it can take valuable time away from early definitive care. If evacuation will be delayed or if patient is in shock, fluid resuscitation should be initiated regardless but controlled resuscitation needs to take place if crystalloids are to be used secondary to risk of shock lung.

Army doctrine and the tactical scenario require the mobile CCPs to follow the Forward Edge of the Battle Area. Because air bases have known geography and distances, stopping at the CCP gives up the advantage gained by the proximity to definitive forward resuscitative surgery capability. Despite recurrent criticisms that limited realistic medical training impacted negatively during Desert Storm and the lack of use during real-world missions, the CCP is still be trained and inspected. The falsely increased rate of patient presentations during operational readiness inspections has created its own justification and guidelines that disregard the historically decreased base threat and accordingly decreased incidents that geographically dispersed CCPs will be able to impact. CCPs, due to the level of expertise, will provide questionable triage effectiveness and will not able to resuscitate or provide ALS to those identified as most needing care. The CCP has additional chemical warfare responsibilities that place it at increased risk of exposure while ignoring the capabilities of the MTF decontamination team.

Large numbers of patients with additional surges are planned on being moved through the AE system of which disease and non-battle injury plays a significant role in AE patient load and needs to be addressed. The change in doctrine from 'stabilized' to 'stable' AE patients and from 'return to duty' to 'replace', increased accuracy of attrition projection, decreased forward manning mandate decreased evacuation policies with accordingly better AE resources, systems, and support. The increased number of smaller scale missions, limited number of personnel deployed to bare bases, and AE surges mandate the consolidation of manning at the MTF to most efficiently handle all contingencies. Focused disasters are best handled by sending experienced teams to the disaster site to control the site and resources, triage patients from the scene, and control the pace of evacuation to the nearest hospital.

Recommendations

The various aspects of combat that are supported and the method with which the medical care system is organized will influence the ultimate indicator of military medicine's capability to mitigate the effects of war injuries, the 'died of wounds' rates. Any possibility to improve survivability and morale (as occurred with the Israeli Self Defense Force) needs to be explored despite perceived negative impact that having the wounded member's comrades complete the transport to the MTF might have upon warfighting capability. To ensure that the design of base medical support plans remain objective in mitigating the 20-25% killed in action and ~2% 'died of wounds' rates that recent conflicts have generated (Reis 1989) performance statistics (ambulance use rates, size of the service area, and minimum and maximum response times) of various types need to be reviewed to optimize future policies (Valenzuela 1990.) An eight-minute criterion was set in this civilian study because Advanced Life Support interventions in cardiac emergencies have limited effectiveness after eight minutes. For combat purposes, SA/BC capabilities and limitations should be conflicted with the forced immobility during an attack and the subsequent requirements on the airmen after the attack, to ensure the most efficient use of Trunkey's golden hour defines acceptable base medical support criteria.

It appears that the operational readiness inspection process (how the group will fulfill the requirements for the CCP) was the focus without validating the content (base primary response and casualty care issues.) During Operations Desert Storm and Allied Force the Air Force Medical Service did not set up CCPs. A Major Command Readiness Officer involved with the process stated that objective documentation of an increased returned to duty rate, decreased time for worksite personnel away, or increased combat effectiveness with CCP use has not been made due to the excessive manning that would be required to perform that additional assessment during an inspection. Real world scenarios using both the forward deployed MTF and fixed overseas bases are needed to test the capabilities and limitations of Major Commands that use and do not use the CCPs.

Because the AF flies in and out of the area of operations from distant bases, base support plans should focus more on supporting the flying mission, preparing and assisting AE from the combat zone to the rear, and ensuring that a sound mass casualty

plan exists for a terrorist / missile attack or enemy incursion. The capabilities of the hospital are not exercised and inspected as the base will utilize them but more of a system created from the inspection process itself. The struggle should not be on how to test capability but on ensuring validity and maximizing effectiveness.

A multidisciplinary group is needed to establish the requirements expected to accomplish the mission in the most efficient way while providing the means to test readiness. Discussion of the optimal way to accomplish these goals will should include a recommendation of continuing with the operational readiness inspection as it is using the CCP, developing an objective method to validate either the current or proposed method, or dropping the CCP and pressing with the proposed policy change directly. Instead of adopting the current inspection/CCP system across the AF, the working group must stimulate grass roots ownership that is based upon mission essential contributions by the forward deployed MTF. If that requires significant increases in training all airmen to increase survivability while maintaining warfighting, AE, and base support plan functionality then decisive actions need to be made for the good of all.

If the answer is to press with current guidance, then the AF needs to internally validate the CCP's contributions to the base support plan. Concept of operations and mission capability statements would provide structure, standardization, and scope of practice for the CCP to delineate the increased deployment and fixed base manning needs that will ensure that the base medical support is not compromised. If the AF will test the current against the proposed policy there are some fundamental issues that need to be addressed:

What are the criteria for which the CCP will be inspected? The time criteria, 'ability to survive and operate' performance measures, and basic medical skills that are tested at the CCP add no unique capabilities to the echelons of care similar to the transition from SA/BC to the base MTF. Future inspections need to objectify the gains made by dropping off the patients at a CCP compared with taking them directly to the MTF. Bases that use and those that don't use the CCP concept need to be tested with the same scenarios to provide objective evidence that the CCP decreases the time for return to each unit while improving the mortality and morbidity of the wounded. Vehicle use, communications, chemical warfare casualty care, and manning need to be addressed in these scenarios to fully judge their effects on the different and interrelated aspects of the base support plan.

Will the CCP keep AF warriors in the fight? The exercises need to demonstrate a decrease in the time that it takes for line personnel to take their wounded to the CCP vs. the MTF and compare the return to duty rates for both the transporters and the wounded as well as the survivability of the wounded. When does the transport time become significant? What injuries are the medical personnel at a CCP able to return the warfighters to duty?

Will the time lost due to SA/BC and transport to the base MTF decrease combat effectiveness? This paper has demonstrated the medical advantages of having each work center evacuate their wounded directly to the MTF instead of the CCP but the proposed increase in warfighting capabilities with a reduced survivability that staffing the CCPs provides has not been objectively measured. Beyond the question of one or a few patients, comes the risk to the AE mission. At what point will hospital's capability to perform its mission be threatened by the mandated manning of base wide CCPs?

How many CCPs are needed per base? If the criteria is the 25 minutes after the attack has ended to get to the CCP and then 20 minutes to the MTF, then each base will need to have as many CCPs as it takes to meet that criteria. If the base is broken up geographically over a significantly large area (greater than de Boer's 10 km,) the base support plan should resource providers at the distant site(s) to provide stabilizing and resuscitative care similar to a Battalion Aid Station prior to evacuation to the MTF for surgical intervention.

The rate of inter-hospital transfer of patients divided by those that reach an emergency room has been proposed as a quality assurance indicator of triage accuracy (usually ~50% for over triage and ~5% for under triage; Leibovici 1997.) Over and under triage could also be used as objective indicators during inspections to establish that CCPs are correctly returning warfighters to duty or evacuating patients.

If the old will be scrapped for the new, the SABC program will continue with commander emphasis so that the airmen will be able to impact each other's survivability. The combat lifesaver program would need to be incorporated as an adjunct to the SA/BC program. It would offer the expertise at each work center to coordinate the initial care and evacuation to the MTF. Bolstering these two programs will facilitate the MTF's contributions to the base support plan and will improve morale.

The inspection process should motivate units to perform secondary to gains in capabilities that will be used in real world contingencies. If the unit cannot become adept at wartime missions and provide for their survival and the survival of their patients, they will not be able to progress towards higher levels of performance and esprit. The psychological contract between hospital commander and staff is breached due to perceived misuse of their time and effort. When one participates in an exercise or inspection that will not impact nor improve wartime casualty care, personnel will become disillusioned and employee satisfaction, productivity, and willingness to proactively participate will be threatened.

The line needs to be briefed on the benefits of increasing the SA/BC program to include 'combat lifesaver' training and directly transporting the casualties to the MTF instead of using the CCP. It will create some discomfort because this would increase unit responsibility in providing medical care and evacuating the wounded and there will be a transient drop in efficiency while the base reorients its inspection process to match real world missions. Real world patient predictions are classified information but the basic process could be flowcharted to assist in validating the new method.

Focused single incident mass casualty situations are best managed by a trained primary response team that should be mobilized and sent directly to the site. Manning and fielding that team instead of a CCP allows practical use of those personnel until one of those rare events occurs. At that time, triage and patient care would be located at the site where it would do the most good.

For all other contingencies, vehicles with patients would be initially evaluated at the entry control point of the hospital's patient decontamination station (set it up downwind beyond the 150' boundary of the MTF) to determine if they are contaminated. If they were, they would go through the decontamination tent and then treated as soon as possible by the medics of the decontamination team. After decontamination, the wounded would be sent to the MTF's triage station to be evaluated with uncontaminated wounded.

Responding to any mass casualty situation as they arise using the primary response team concept (Fisher 1977, Koehler 1992, Rignault 1989) offers the base and community a well-understood and daily practiced plan that provides on site care of casualties for mass disasters. The team offers the MTF and base. It also consolidates the medical personnel at the hospital to efficiently provide 24 hour medical coverage to the daily increase in inpatients that have been evacuated out of theater as well as being more able to flex with short term surges of patients. Consistent peacetime primary response team response and coordinated care with the other emergency response agencies on base will build confidence and report that in the heat of battle or a mass casualty situation, would serve to stabilize what are very stressful situations.

BIBLIOGRAPHY

Adams DV, Burns DC, Clines TC, Kim MH (1997) "Joint Health Service Support: Supporting Joint Vision 2010." J-4, Medical Readiness Division, Joint Staff, Pentagon, Washington, D.C.

Ammons MA, Moore EE, Pons PT, Moore FA, McCroskey BL, Cleveland HC (1988). "The Role of a Regional Trauma System in the Management of a Mass Disaster: An Analysis of the Keystone, Colorado, Chairlift Accident." Journal of Trauma 28(10): 1468-71.

Bailey J (1983). "Training for War: the Falklands 1982." Military Review 63: 58 - 70.

Baker FJ 2d (1979). "The Management of Mass Casualty Disasters." Topics in Emergency Medicine 1(1): 149-57.

Baker MS, Ryals PA (1999). "The Medical Department in Military Operations other than War. Part I. Planning for Deployment." Military Medicine 164(8): 572-9.

Batty CG (1999). "Changes in the Care of the Battle Casualty: Lessons Learned from the Falklands Campaign." Military Medicine 164(5):(5): 336-40.

Bellamy RF (1984). "The Causes of Death in Conventional Land Warfare: Implications for Combat Casualty Care Research." Military Medicine 149(2): 55-62.

Bellamy RF (1987). "How Shall We Train for Combat Casualty Care?" Military Medicine 152(12): 617-21.

Bellemy RF (1987). "Death on the Battlefield and the Role of First Aid." Military Medicine 152: 634-5.

Bickell WH (1994). "Immediate versus Delayed Fluid Resuscitation for Hypotensive Patients with Penetrating Torso Injuries." New England Journal of Medicine 331(17): 1105-9.

Blood CG, Gauker ED (1993). "The Relationship Between Battle Intensity and Disease Rates Among Marine Corps Infantry Units." Military Medicine 158(5): 340-4.

Blood CG, Gauker ED, Jolly R, Pugh MA (1994). "Comparisons of Casualty Presentation and Admission Rates During Various Combat Operations." Military Medicine 159(6): 457-61.

Blood CG, Anderson ME (1994). "The Battle for Hue: Casualty and Disease Rates During Urban Warfare." Military Medicine 159(9): 590-5.

Blood CG, Jolly R (1995). "Comparisons of Disease and Nonbattle Injury Incidence Across Various Military Operations." Military Medicine 160(5): 258-63.

Blood CG, O'Donnell ER (1995). "A System to Project Injury and Illness Incidence During Military Operations." Journal of Medical Systems 19(6): 457-64.

Bohonos JJ, Hogan DE (1999). "The Medical Impact of Tornadoes in North America." Journal of Emergency Medicine 17(1): 67-73.

Border J, Lewis FR, Aprahamian C, Haller JA, Jacobs LM, Luterman A (1983). "Panel: Pre-Hospital Trauma Care - Stabilize or "Scoop And Run"." Journal of Trauma 23: 708-11.

Brannon RH, Spoon D. (1998). Operational Health Support Into the Next Millennium, Karta Technologies, Inc.

Burkle FM Jr, Newland C, Orebaugh S, Blood CG (1994). "Emergency Medicine in the Persian Gulf War--Part 2. Triage Methodology and Lessons Learned." Annals of Emergency Medicine 23(4): 748-54.

Butler FK, Hagmann JH, Butler EG (1996). "Tactical Combat Casualty Care in Special Operations." Military Medicine 161(Suppl): 3-16.

Butler FK, Hagmann JH (2000). "Tactical Management of Urban Warfare Casualties in Special Operations." Military Medicine 165(Supplement 1).

Cain RL, Schwartz RR (1986). "Do We Really Need Self Aid / Buddy Care?" Military Medicine 151(2): 101-3.

Cancio LC, Goforth GA (1993). "Emergency Medical Training in the 82d Airborne Division. The Gulf War Experience." Prehospital and Disaster Medicine 8(4): 345-8.

Carey ME (1988). "An Analysis of U.S. Army Combat Mortality and Morbidity Data." Journal of Trauma 40(3 Suppl): S183-9.

Carey ME (1996). "Analysis of Wounds Incurred by U.S. Army Seventh Corps Personnel Treated in Corps Hospitals During Operation Desert Storm, February 20 to March 10, 1991." Journal of Trauma 40((3 Suppl)): S165-9.

Carlascio DR, McSharry MC, LeJeune CJ, Lewis JH, Schneider CN, Marshall WJ (1991). "Air Medical Response to the 1990 Will County, Illinois, Tornado." The Journal of Air Medical Transport 10(10): 7, 9-11, 13-6.

Christen HT, Maniscalco PM (1998). "EMS Incident Management: The Treatment Sector in Mass Casualty Events. A Multi-Part Series." Emergency Medical Services 27(6): 46-8.

Cowley RA, Dunham CM (1982). Shock Trauma / Critical Care Manual. Baltimore, Md, University Park Press.

Crawford PE, Kerstein MD (1995). "The Navy Nurse and Combat with a Focus on the Casualty Processing Unit." Military Medicine 160(12): 614-6.

Croft AM, Hoad NA, Dale RF (1999). "Hospitalization of British Troops During Operation Joint Endeavor (Bosnia)." Military Medicine 164(7): 460-5.

de Boer J, Baillie TW (1984). "Progressive Medical Care in Disaster Situations: A Critical Evaluation of the Current Situation in the Netherlands." Journal of Emergency Medicine 1: 339-343.

de Boer J, Brismar B, Eldar R, Rutherford WH (1989). "The Medical Severity Index of Disasters." Journal of Emergency Medicine (3): 269-73.

Deakin CD (1994). "Early Fluid Resuscitation in Hemorrhagic Shock." European Journal of Emergency Medicine 1(2): 83-5.

Deakin CD, Davies G (1994). "Defining Trauma Patient Subpopulations for Field Stabilization." European Journal of Emergency Medicine 1(1): 31-3.

Dice WH (1991). "The Role of Military Emergency Physicians in an Assault Operation in Panama." Annals of Emergency Medicine 20(12): 1336-40.

Dolev ED, Llewellyn CH (1985). "The Chain of Responsibility in Battlefield Medicine." Military Medicine 150(9): 471-5.

Donovan PJ, Cline DM, Whitley TW, Foster C, Outlaw M (1989). "Prehospital Care by EMT's and EMT-1's in a Rural Setting: Prolongation of Scene Times by ALS Procedures." Annals of Emergency Medicine 18: 495-500.

Donovan W, Mellen PF (1989). "Clinically Intensive Medical Training for Combat." Military Medicine 154(11): 546-8.

Dupuy TN (1990). Attrition: Forecasting Battle Casualties and Equipment Losses in Modern War. Fairfax, VA, Hero Books.

Feliciano DV, Anderson GV, Rozycki GS, Ingram WL, Ansley JP, Namias N, Salomone JP, Cantwell JD (1998). "Management of Casualties from the Bombing at the Centennial Olympics." American Journal of Surgery 176(6): 538-43.

Fisher C (1977). "Mobile Triage Team in a Community Disaster Plan." Journal of the American College of Emergency Physicians 6(1): 10-2.

Fosse E, Husum H, Giannou C (1988). "The Siege of Tripoli 1983: War Surgery in Lebanon." Journal of Trauma 28: 660-3.

Frykberg ER, Hutton MJ, Balzer RH (1987). "Disaster in Beirut: an Application Of Mass Casualty Principles." Military Medicine 152(11): 563-6.

Frykberg ER, Tepas JJ (1988). "Terrorist Bombings. Lessons Learned from Belfast to Beirut." Annals of Surgery 208(5): 569-76.

Frykberg ER, Tepas JJ, Alexander RH (1989). "The 1983 Beirut Airport Terrorist Bombing. Injury Patterns and Implications for Disaster Management." The American Surgeon 55(3): 134-41.

Garrison MW, Miller G, Rohan E (1990). "Cincinnati's Collaborative Response for Mass Casualty Incidents." Journal of Emergency Nursing 16(4): 274-8.

Gerace RV (1979). "Role of Medical Teams in a Community Disaster Plan." Canadian Medical Association 120: 923-8.

Gofrit ON, Leibovici D, Shapira SC, Shemer J, Stein M, Michaelson M (1997). "The Trimodal Death Distribution of Trauma Victims: Military Experience from the Lebanon War." Military Medicine 162(1): 24-6.

Gunby P (1992). "Two Years After Iraqi Invasion, US Military Medicine Studies Desert Shield/Storm While Looking Ahead." Journal of the American Medical Association 268(5): 577-8.

Hawley A (1996). "Trauma Management on the Battlefield: A Modern Approach." Journal of the Royal Army Medical Corps 142(3): 120-5.

Haynes BE, Dahlen RD, Pratt FD, Sullivan RM (1986). "A Prehospital Approach to Multiple-Victim Incidents." Annals of Emergency Medicine 15(4): 458-62.

Holloway RD, Stegila JF, Ryan CT (1978). "The EMS System and Disaster Planning: Some Observations." Journal of the American College of Emergency Physicians 7(2): 60-1.

Humphrey JC (1999). "Casualty Management: Scud Missile Attack, Dhahran, Saudi Arabia." Military Medicine 164(5): 322-6.

Jacobs LM, Gabram GA, Stohler SA (1991). "The Integration of a Helicopter Emergency Medical Service in a Mass Casualty Response System." Prehospital and Disaster Medicine 6(4): 451-4.

Jankovic S, Dodig G, Biocic M, Stivicevic V, Stajner I, Primorac D (1998). "Analysis of Medical Aid to Croatian Army Soldiers Wounded at the Front Line." Military Medicine 163(1): 13-6.

Janousek JT, Jackson DE, De Lorenzo RA, Coppola M (1999). "Mass Casualty Triage Knowledge of Military Medical Personnel." Military Medicine 164(5): 332-5.

Jevtic M, Petrovic M, Ignjatovic D, Ilijevski N, Misovic S, Kronja G, Stankovic N (1996). "Treatment of wounded in the combat zone." Journal of Trauma 40(3 Suppl): S173-6.

Jones EL, Peters AF, Gasior RM (1968). "Early Management of Battle Casualties in Vietnam." Archives of Surgery 97(1): 1-15.

Kaufman LW, Belenky GL (1984). "Staying Alive; Knowing What to Do Until the Medic Arrives." Military Review (Jan): 29-33.

Klausner JM, Rozin RR (1986). "The Evacuation Hospital in Civilian Disasters." Israeli Journal of Medical Science 22(5): 365-9.

Koehler RH, Smith RS, Bacaner T (1994). "Triage of American Combat Casualties: The Need for Change." Military Medicine 159(8): 541-7.

Leibovici D, Gofrit ON, Heruti RJ, Shapira SC, Shemer J, Stein M (1997). "Interhospital Patient Transfer: A Quality Improvement Indicator for Prehospital Triage in Mass Casualties." American Journal of Emergency Medicine 15(4): 341-4.

Leppaniemi AK (1998). "Medical Challenges of Internal Conflicts." World Journal of Surgery 22(12): 1197-201.

Llewellyn CH (1992). "Triage in Austere Environments and Echeloned Medical Systems." World Journal of Surgery 16: 904-9.

Lloyd S (1987). "Mast and IV Infusion: Do They Help in Pre-Hospital Trauma Management." Annals of Emergency Medicine 16: 565-67.

Lovric Z, Mihaljevic J, Martinac M (1997). "Mobile Surgical Teams of Croatian Special Police Forces: Analysis of Casualties During Combat." Military Medicine 162(5): 360-2.

Lynch P, Griffin K, Terrell AG, Pealin D (1997). "Medical Planning: Casualty Treatment Times at First and Second Line." Journal of the Royal Army Medical Corps 143(2): 83-9.

Mahoney LE, Reutershan TP (1987). "Catastrophic Disasters and the Design of Disaster Medical Care Systems." Annals of Emergency Medicine 16(9): 1085-91.

Maricevic A, Erceg M (1997). "War Injuries to the Extremities." Military Medicine 162(12): 808-11.

Martin TE (1990). "The Ramstein Airshow Disaster." Journal of the Royal Army Medical Corps 136: 19-26.

Martin TE (1993). "Resolving the Casualty Evacuation Conflict." Injury 24(8): 514-6.

Maughon JS (1970). "An Inquiry into the Nature of Wounds Resulting in Killed in Action in Vietnam." Military Medicine (Jan): 8-13.

McCallum AL, Rubes CR (1996). "Prehospital Interventions." Emergency Medicine Clinics of North America 14(1): 1-12.

Melton RJ, Riner RM (1981). "Revising the Rural Hospital Disaster Plan: A Role for the EMS System in Managing the Multiple Casualty Incident." Annals of Emergency Medicine 10(1): 39-44.

Morris BA, Armstrong TM (1986). "Medical Response to a Natural Disaster: the Barrie Tornado." Canadian Medical Association Journal 134(Apr 1): 767-9.

Naggan L, Cordova M (1974). "Evacuation and Treatment of the Wounded in the Yom Kippur War." Harefuah 87: 531.

Naggan L (1976). "Medical Planning for Disaster in Israel. Evaluation of the Military Surgical Experience in the October 1973 War, and Implications for the Organization of the Civilian Disaster Services." Injury 7(4): 279-85.

Nguyen D (1990). "Mass Casualties on the Modern Battlefield: Problems and Proposed Solutions." Military Medicine 155: 186-7.

Pearce FJ, Lyons WS (1999). "Logistics of Parenteral Fluids in Battlefield Resuscitation." Military Medicine 164(9): 653-5.

Petricevic A, Ilic N, Radonic V, Mimica Z, Petricivic M, Busic Z, Tanfara S (1998). "Our Experience with 2693 Wounded Treated at the Split University Hospital During the 1991-1995 Period." International Surgery 83(2): 98-105.

Pretto A, Ricci E, Klain M, Safar P, Semenov V, Abrams J, Tisherman S, Crippen D, Comfort L (1992). "Disaster Reanimatology Potentials: A Structured Interview Study in Armenia. III. Results, Conclusions, and Recommendations." Prehospital and Disaster Medicine 7(4): 327-37.

Prgomet D, Puntaric D, Balen I, Danic D (1996). "Organization and Work of Medical Service During 1992 Military Operations in North Bosnia (Bosanska Posavina)." Military Medicine 161(11): 661-4.

Quarentelli EL (1977). Delivery of Emergency Medical Services in Disasters. Columbus, Ohio, Ohio State University.

Quarentelli EL (1983). Delivery of Emergency Medical Services in Disasters: Assumptions and Realities. New York, Irvington Publishers Inc.

Radonic V, Aras N, Pavic A (1993). "Organization and Functioning of the Front-Line Surgical Station at Rama in Bosnia and Herzegovina." Military Medicine 158(Dec): 763-6.

Reis ND (1989). Manual of Disaster Medicine; Civilian and Military. Berlin, Germany, Springer-Verlag.

Richardson WR (1984). "TRADOC Pursuit of Doctrine Sufficiency Multifaceted." Army 34(10): 79-88.

Rignault DP, Deligny MC (1989). "The 1986 Terrorist Bombing Experience in Paris." Annals of Surgery 209(3): 368-73.

Rouse A (1991). "Do Ambulance Crews Triage Trauma Patients?" Archives of Emergency Medicine 8(3): 185-91.

Rozin R, Klausner JM, Dolev E (1988). "New Concepts of Forward Combat Surgery." Injury 19: 193.

Rozin RR (1986). "Integration of Military Unit and Civilian Hospital During Mass Casualty Situation: Experience During the 1982 Lebanon War." Military Medicine 151(11): 580-2.

Safar P (1988). Resuscitation Medicine Including the Management of Severe Trauma. Medicine for Disasters. Baskett P. London, Butterworth and Co: 36-86.

Saric V, Atias-Nikolov V, Kovac T, Frankovic E, Mrsic V, Lukac J (1994). "NATO War Medicine Doctrine Revisited in Bosnia and Herzegovina." Journal of the Royal Medical Corps 140: 132-4.
Schou J (1996). "Major Interventions in the Field Stabilization of Trauma Patients: What is Possible?" European Journal of Emergency Medicine 3(4): 221-4.

Seet B (1999). "Levels of Medical Support for United Nations Peacekeeping Operations." Military Medicine 164(7): 451-6.

Seletz JM (1990). "Flugtag-88 (Ramstein Air Show Disaster): an Army Response to a MASCAL." Military Medicine 155(4): 152-5.

Skiendzielewski JJ, Dula DJ (1982). "The Rural Interhospital Disaster Plan: Some New Solutions to Old Problems." Journal of Trauma 22(8): 694-7.

Slavin JD Jr, du Moulin GC, Borden S, Tabaroni R, DeProspero D (1994). "Hospital Integrated Lanes Training: Brigade-Directed Implementation of a Medical Lanes Training Program During Annual Training." Military Medicine 159(11): 704-8.

Slovis CM, Herr EW, Londorf D, Little TD, Alexander BR, Guthmann RJ (1990). "Success Rates for Initiation of Intravenous Therapy en Route by Prehospital Care Providers." American Journal of Emergency Medicine 8: 305-7.

Smith AM, Bellamy RF (1988). "Conceptual Errors in Combat Casualty Care Training." Navy Medicine 79(4): 14-21.

Smith JP, Bodai BI, Hill AS, Frey CF (1985). "Pre-Hospital Stabilization of Critically Injure Patients: A Failed Concept." Journal of Trauma 25: 65-70.

Smith JP, Bodai BI (1985). "The Urban Paramedic's Scope of Practice." Journal of the American Medical Association 253: 544-8.

Strawder GS, Riley KF (1995). "Joint Casualty Evacuation Operations in the Combat Zone." Army Logistician 5: 30.

Stringer JR (2000). "Active Air Force, Reserve & Guard Facilities." Airman Jan: 28-33.

Swan KG, Swan KG Jr (1996). "Triage: the Past Revisited." Military Medicine 161(8): 448-52.

Tierney KJ (1985). "Emergency Medical Preparedness and Response in Disasters: The Need for Interorganizational Coordination." Public Administration Review, Special Issue (77-84).

Committee on Trauma (1986). "Field Categorization of Trauma Patients (Field Triage)." Bulletin of the American College of Surgeons 17-22.

Trunkey DD (1983). "Trauma." Scientific American 249: 28-35.

Ueberle HK, Rose TK (1985). "Medical Policy in the Management of a Mass Casualty Situation with Special Regard to Sorting." Medical Law 4(3): 275-82.

Valenzuela TD, Goldberg J, Keeley KT, Criss EA (1990). "Computer Modeling of Emergency Medical System Performance." Annals of Emergency Medicine 19(8): 898-901.

Vermillion CL (1996). "Operation Just Cause." Aviation Space and Environmental Medicine 67(1): 87-8.

Vick, A. (1995). Snakes in the Eagle's Nest, Rand.

Vojvodic V (1996). "Management of War Casualties in the Military Medical Academy (Belgrade) During Combat Operations in 1991/1992: an Overview." Journal of Trauma 40(3 Suppl): S180-2.

Waeckerle J (1991). "Disaster Planning and Response." New England Journal of Medicine 324(12): 815-21.

Walker GJ, Blood CG (1999). "The Patient Flow of Wounded Marines within a Multi-Echelon System of Care." Military Medicine 164(6): 423-7.

Walker GJ, Blood CG (1999). "The Patient Flow of Marine Disease and Nonbattle Injury Conditions within a Multi-Echelon System of Care." Military Medicine 164(10): 731-6.

Wiedeman JE, Rignault DP (1999). "Civilian Versus Military Trauma Dogma: Who Do You Trust?" Military Medicine 164(4): 256-60.